

## AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An all-optical flip-flop comprising a semiconductor laser, the semiconductor laser being equipped with a waveguide, the waveguide being equipped with a multi-mode interference portion, a plurality of input ports and an output port, the input and output ports being connected to the multi-mode interference portion, with configuration being such that a set pulse from one or more input ports and a reset pulse from one or more remaining input ports is inputted to the multi-mode interference portion, wherein the multi-mode interference portion transmits multi-mode light within, with light outputted due to oscillation based on the set pulse and the reset pulse inputted from the input ports being selectively outputted from the output port, wherein the oscillation is generated in different modes within the multi-mode interference portion in accordance with the set pulse and the reset pulse inputted into the multi-mode interference portion.

2. (Original) The all-optical flip-flop as disclosed in Claim 1, wherein oscillation based on the set pulse and the reset pulse generates different modes according to the set pulse and the reset pulse.

3. (Original) The all-optical flip-flop as disclosed in Claim 1, wherein a plurality of output ports are provided.

4. (Original) The all-optical flip-flop as disclosed in Claim 1, wherein the input ports and the output ports are capable of allowing single mode light to pass.

5. (Previously presented) The all-optical flip-flop as disclosed in Claim 1, wherein saturable absorption regions are provided at the input ports or the output ports.

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6. (Original) The all-optical flip-flop as disclosed in Claim 1, wherein end surfaces of the input port and the output port are reflecting surfaces.

7. (Original) The all-optical flip-flop as disclosed in Claim 1, wherein the input port doubles as the output port.

8. (Original) The all-optical flip-flop as disclosed in Claim 7, wherein a mirror for reflecting inputted light is provided at the multi-mode interference.

9. (Original) The all-optical flip-flop as disclosed in Claim 7, wherein circulators for switching over paths for inputted and outputted light are fitted at the input ports doubling as the output ports.

10. (Currently Amended) An all-optical flip-flop comprising a semiconductor laser, the semiconductor laser being equipped with a waveguide, the waveguide being equipped with a multi-mode interference portion, a plurality of input ports and an output port, the input and output ports being connected to the multi-mode interference portion, with configuration being such that a set pulse from one or more input ports and a reset pulse from one or more remaining input ports is inputted to the multi-mode interference portion, wherein the multi-mode interference portion transmits multi-mode light within, with light outputted due to oscillation based on the set pulse and the reset pulse inputted from the input ports being selectively outputted from the output port using multimode interference, wherein the oscillation is generated in different modes within the multi-mode interference portion in accordance with the set pulse and the reset pulse inputted into the multi-mode interference portion.

11. (Previously presented) The all-optical flip-flop as disclosed in Claim 1, wherein said multi-mode light transmits within the multi-mode interference portion selectively and in an intersecting manner within.

12. (Previously presented) The all-optical flip-flop as disclosed in Claim 1, wherein the multi-mode interference portion outputs said multi-mode light from the output port.

13. (Currently Amended) The all-optical flip-flop as disclosed in Claim 1, wherein the oscillation in the multi-mode interference portion is due to the set pulse or reset pulse inputted from one or more input ~~port~~ ports.

14. (Previously presented) The all-optical flip-flop as disclosed in Claim 1, wherein the multi-mode interference portion constitutes at least a portion of an oscillator of the semiconductor laser.

15. (Previously presented) The all-optical flip-flop as disclosed in Claim 1, wherein the input ports and the output ports reflect a part of light generated by the oscillation within the multi-mode interference portion in order to maintain lasing oscillation of the semiconductor laser.

16. (Previously presented) The all-optical flip-flop as disclosed in Claim 1, wherein the oscillation based on the set pulse and the reset pulse is generated between an input port and an output port.

17. (Previously presented) The all-optical flip-flop as disclosed in Claim 1, wherein the multi-mode interference portion transmits any multi-mode light through an output port as an output light.

18. (Cancelled)